

App. No. 10/604,975
Amendment dated December 8, 2004
Reply to Office action of September 10, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the present application.

Listing of Claims:

Claim 1: (canceled)

Claim 2: (canceled)

Claim 3: (canceled)

Claim 4: (canceled)

Claim 5: (canceled)

Claim 6: (currently amended) A spindle motor comprising:

a shaft;

a sleeve formed with a through-hole for rotary-play insertion of the shaft;

a rotor having a round top plate in the rotational center of which the shaft is furnished united, and a circular cylindrical wall depending from the top plate along its outer rim;

a cover member for closing over one end of the through-hole formed in the sleeve;

a circular cylindrical casing member fitted to said shaft over its outer circumferential surface;

micro-gaps formed continuing between an upper-end face of said sleeve and a bottom face of said rotor top plate, an inner circumferential surface of said sleeve and an outer circumferential surface of said casing member, and an inner face of said cover member and end faces of said shaft and said casing member;

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oil retained continuously without interruption within said micro-gaps throughout their entirety;

a radial dynamic-pressure bearing section configured intermediately by at least one surface of either said sleeve inner-circumferential surface or said casing member outer-circumferential surface, and by said oil when said rotor spins, and provided with, as dynamic-pressure-generating striations, herringbone grooves for inducing into said oil when said rotor spins hydrodynamic pressure;

a thrust bearing section configured on at least one of either said sleeve upper-end face or said top plate bottom face, and furnished with dynamic-pressure-generating striations for imparting to said oil radially inward-heading pressure when said rotor spins;

an axial support section, formed between said cover member inner face and said shaft end face, having pressure essentially balancing radially inward-heading pressure generated in said thrust bearing section, wherein said rotor is lifted through cooperation of said thrust bearing section and said ~~bearing~~ axial support section; and

a communicating pathway formed in between said shaft along its outer circumferential surface and said casing member along its inner circumferential surface, for communicating said oil retained in, and enabling it to circulate between, the micro-gap formed between said sleeve upper-end face and the bottom face of said rotor top plate, and the micro-gap formed between said cover member inner face and said shaft and casing member end faces.

Claim 7: (original) A spindle motor as set forth in claim 6:

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a helical groove being formed on the outer circumferential surface of said shaft in a single path running from its upper-end portion to its lower-end portion;

wherein fitting said casing member over the outer circumferential surface of said shaft defines said communicating pathway between said helical groove and the inner circumferential surface of said casing member.

Claim 8: (currently amended) A spindle motor as set forth in claim 6:

an outer circumferential surface of said sleeve and an inner circumferential surface of said rotor circular cylindrical wall opposing via a radial gap;

and said sleeve outer circumferential surface periphery being provided with a taper surface constricting in outer diameter according as ~~its separation~~ it separates from said rotor top plate;

wherein and said oil is retained by a meniscus forming in between said taper surface and the inner-circumferential surface of said rotor circular cylindrical wall.

Claim 9: (original) A spindle motor as set forth in claim 8, wherein:

a stepped portion continuous with said taper surface is provided in said sleeve by recessing its outer circumferential surface radially inwardly;

an annular member projecting radially inward corresponding to the stepped portion is fixedly fitted into the inner-circumferential surface of said rotor circular cylindrical wall, and a rotor retainer is constituted by engagement of the stepped portion and the annular member;

a micro-gap smaller than the minimum clearance of the radial gap formed between the taper surface of said sleeve and the inner-circumferential surface of

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said rotor circular cylindrical wall, is formed to function as a labyrinth seal between the annular member along its upper face and said sleeve stepped portion along its undersurface.

Claim 10: (original) A spindle motor as set forth in claim 6, said radial dynamic-pressure bearing section being configured between said shaft outer-circumferential surface and said sleeve inner-circumferential surface as an axially separated pair of radial dynamic-pressure bearing constituents, wherein as the dynamic-pressure-generating striations in each radial bearing constituent, herringbone-groove forming contiguous pairs of spiral grooves for inducing into said oil when said rotor spins hydrodynamic pressure whose pressure gradient becomes axially symmetrical are provided.

Claim 11: (original) A spindle motor as set forth in claim 6, said radial dynamic-pressure bearing section being configured between said shaft outer-circumferential surface and said sleeve inner-circumferential surface as an axially separated pair of radial dynamic-pressure bearing constituents, wherein as the dynamic-pressure-generating striations in at least one of either said pair of radial dynamic-pressure bearing constituents, asymmetrically configured herringbone grooves for inducing into said oil when said rotor spins hydrodynamic pressure acting unidirectionally in the axial direction are provided.

Claim 12: (original) A spindle motor as set forth in claim 6, wherein said rotor is urged in a direction toward said cover member by axially acting magnetic force.

Claim 13: (canceled)

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Claim 14: (canceled)

Claim 15: (canceled)

Claim 16: (canceled)

Claim 17: (canceled)

Claim 18: (canceled)

Claim 19: (canceled)

Claim 20: (canceled)

Claim 21: (canceled)

Claim 22: (canceled)

Claim 23: (currently amended) A disk-drive device including a housing, a spindle motor fixed inside said housing for spinning recording disks, and an information access means for writing information into and reading information out from needed locations on the recording disks, wherein said spindle motor comprises:

a shaft;

a sleeve formed with a through-hole for rotary-play insertion of the shaft;

a rotor having a round top plate in the rotational center of which the shaft is furnished united, and a circular cylindrical wall depending from the top plate along its outer rim;

a cover member for closing over one end of the through-hole formed in the sleeve;

a circular cylindrical casing member fitted to said shaft over its outer circumferential surface;

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micro-gaps formed continuing between an upper-end face of said sleeve and a bottom face of said rotor top plate, an inner circumferential surface of said sleeve and an outer circumferential surface of said casing member, and an inner face of said cover member and end faces of said shaft and said casing member;

oil retained continuously without interruption within said micro-gaps throughout their entirety;

a radial dynamic-pressure bearing section configured intermediately by at least one surface of either said sleeve inner-circumferential surface or said casing member outer-circumferential surface, and by said oil when said rotor spins, and provided with, as dynamic-pressure-generating striations, herringbone grooves for inducing into said oil when said rotor spins hydrodynamic pressure;

a thrust bearing section configured on at least one of either said sleeve upper-end face or said top plate bottom face, and furnished with dynamic-pressure-generating striations for imparting to said oil radially inward-heading pressure when said rotor spins;

an axial support section, formed between said cover member inner face and said shaft end face, having pressure essentially balancing radially inward-heading pressure generated in said thrust bearing section, wherein said rotor is lifted through cooperation of said thrust bearing section and said bearing axial support section;

and a communicating pathway formed in between said shaft along its outer circumferential surface and said casing member along its inner circumferential surface, for communicating said oil retained in, and enabling it to circulate between,

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the micro-gap formed between said sleeve upper-end face and the bottom face of said rotor top plate, and the micro-gap formed between said cover member inner face and said shaft and casing member end faces.

Claim 24: (original) A disk-drive device as set forth in claim 23:

a helical groove being formed on the outer circumferential surface of said shaft in a single path running from its upper-end portion to its lower-end portion;

wherein fitting said casing member over the outer circumferential surface of said shaft defines said communicating pathway between said helical groove and the inner circumferential surface of said casing member.

Claim 25: (currently amended) A disk-drive device as set forth in claim 23:

an outer circumferential surface of said sleeve and an inner circumferential surface of said rotor circular cylindrical wall opposing via a radial gap;

and said sleeve outer circumferential ~~surface~~ periphery being provided with a taper surface constricting in outer diameter according as ~~its separation~~ it separates from said rotor top plate;

wherein and said oil is retained by a meniscus forming in between said taper surface and the inner-circumferential surface of said rotor circular cylindrical wall.

Claim 26: (original) A disk-drive device as set forth in claim 25, wherein:

a stepped portion continuous with said taper surface is provided in said sleeve by recessing its outer circumferential surface radially inwardly;

an annular member projecting radially inward corresponding to the stepped portion is fixedly fitted into the inner-circumferential surface of said rotor circular

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cylindrical wall, and a rotor retainer is constituted by engagement of the stepped portion and the annular member;

a micro-gap smaller than the minimum clearance of the radial gap formed between the taper surface of said sleeve and the inner-circumferential surface of said rotor circular cylindrical wall, is formed to function as a labyrinth seal between the annular member along its upper face and said sleeve stepped portion along its undersurface.

Claim 27: (currently amended) A disk-drive device as set forth in claim 23, wherein:

said radial dynamic-pressure bearing section being is configured between the outer-circumferential surface of said shaft casing member ~~outer-circumferential surface and~~ said sleeve inner-circumferential surface as an axially separated pair of radial dynamic-pressure bearing constituents, ~~wherein; and~~

as the dynamic-pressure-generating striations in each radial bearing constituent, herringbone-groove forming contiguous pairs of spiral grooves for inducing into said oil when said rotor spins hydrodynamic pressure whose pressure gradient becomes axially symmetrical are provided.

Claim 28: (currently amended) A disk-drive device as set forth in claim 23, wherein:

said radial dynamic-pressure bearing section being is configured between the outer-circumferential surface of said shaft casing member ~~outer-circumferential~~

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surface and said sleeve inner-circumferential surface as an axially separated pair of radial dynamic-pressure bearing constituents, ~~wherein;~~ and

as the dynamic-pressure-generating striations in at least one of either said pair of radial dynamic-pressure bearing constituents, asymmetrically configured herringbone grooves for inducing into said oil when said rotor spins hydrodynamic pressure acting unidirectionally in the axial direction are provided.

Claim 29: (original) A disk-drive device as set forth in claim 23, wherein said rotor is urged in a direction toward said cover member by axially acting magnetic force.

Claim 30: (canceled)

Claim 31: (canceled)

Claim 32: (canceled)

Claim 33: (canceled)

Claim 34: (canceled)